SECTION THREE
AFFECTED ENVIRONMENT, SIGNIFICANT IMPACTS AND MITIGATION MEASURES

This section includes a discussion of the existing environment that may be affected by the proposal, significant impacts of the proposed action and other alternatives, reasonable mitigation measures, and a summary of adverse impacts which cannot be mitigated. Additionally, this section evaluates the extent to which the proposal is consistent with adopted plans and programs.

This section deals with significant impacts to soils, water, air, environmental health, land use, circulation, public services, utilities and energy use.

ELEMENTS OF THE NATURAL ENVIRONMENT

A. Earth Resources

Five soil studies have been conducted on the subject site in the past five years. The three principal studies are: Hart Crowser's Preliminary Soils Exploration and Ground water Study (1980), and two studies by Terra Associates, Preliminary Subsurface Exploration (February, 1985) and Stability Analysis of Cut Slopes, South Slope Cut Area, (February, 1985).

Two smaller studies involved a 140-foot test boring in the high knoll area (Terra, 1984) and Estimates of Volume of Fill in the High Knoll Area (Kegel, 1984).

This section on Earth Resources is a summary of the foregoing studies, supplemented by grading and erosion control plans prepared by the engineering staff at Clark, Coleman & Rupeiks, Inc.

1. Existing Conditions - Historic Role as Borrow Pit: Perhaps the most important fact in understanding the existing soil conditions is that the site has been a major source of high-quality sand fill since 1915. Over half a century of operations at two borrow pits - the Olson Place Sand Pit, located near Olson Place S.W. and the Cloverdale Pit, at the southern end of the site - have removed most of the sand from the site. However, the site is not exhausted.

   A 1984 study by Kegel & Associates revealed that 1.3 million cubic yards of high-quality sand still remains in the west-central knoll. The planned removal of this sand over a 5-year period (1985-1989) is discussed under "Expected Project Impacts."

2. Geological History: The predominant geologic feature on the site is the considerable thickness of sand strata which has been "borrowed out" through the years. This sand is exposed over much of the property west of Myers Way except where it is mantled by areas of till.

The soils of the project area were deposited as a result of glaciation during and after the Vashon Stage of the the Fraser Glaciation. Soils found on the site which are indicative of Vashon deposits are glacial till and recessional sand.

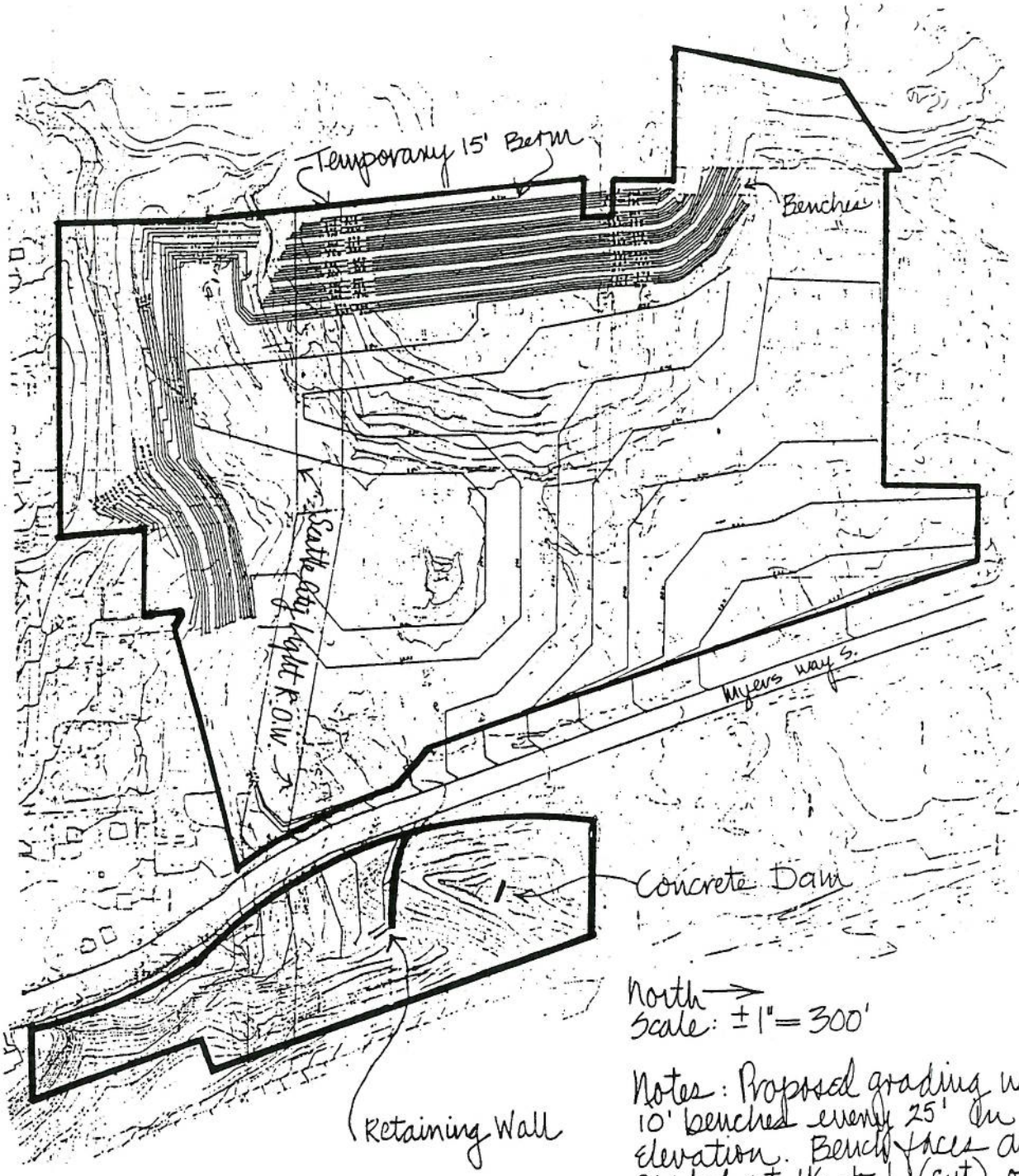
As glacial ice overrode the Puget Sound area about 13,000 years ago, a compact mixture of variable size gravel in a matrix of sand, silt, and clay was deposited. This was deposited underneath the glacier as it advanced, and is known as glacial till. Due to the thickness of the overlying ice sheet, these glacially overridden deposits are highly compacted.

The sand deposits on the site were probably deposited as recessional outwash during the retreat of the Vashon glaciation. Subsurface explorations disclosed relatively minor amounts of gravel in the recessional outwash sands. The sand was typically clean, with occasional silty lenses.

The till "cap" still persists in its natural state over most of the west-central knoll area at elevations of 350 to 385 feet. Earlier glacial advances also deposited tills in lower strata at depths below the area. This explains the presence of till in the creek bottom on the 7-acre site east of Myers Way.

3. Existing Topography: The existing and proposed topography are shown on the grading plan, Figure 4, with Figure 5 showing areas of site work. The existing site topography on Parcel 1 is largely the result of more than 60 years of excavation. Where once a 150-foot high mountain of sand existed (top elevation 385 feet), there is now only a U-shaped pit floor area (approximately 40 acres, average elevation 225 feet) defined by steep cut slopes in the west-central portion of the site and along the southern property line. This configuration resulted from two borrow pit operations running simultaneously on the site by different owners. The Overlook Heights Associates and their predecessors mined the northern end of the present site from 1923 to 1974. The Desimone family mined the southern and east central (County) portions of the property for many years. Amid all this activity, the owner of the knoll property (in the west-central portion of the site) preferred raising pigs to excavating sand. The top of the knoll area (average elevation 365 feet) is the only remnant of the pre-1900 site configuration. It is a generally level area 250 feet wide by 1,000 feet long, surrounded by 60 to 70 percent slopes. Parcel 2, east of Myers Way South, is a 7-acre ravine, with eastward slopes ranging between 16 and 35 percent.

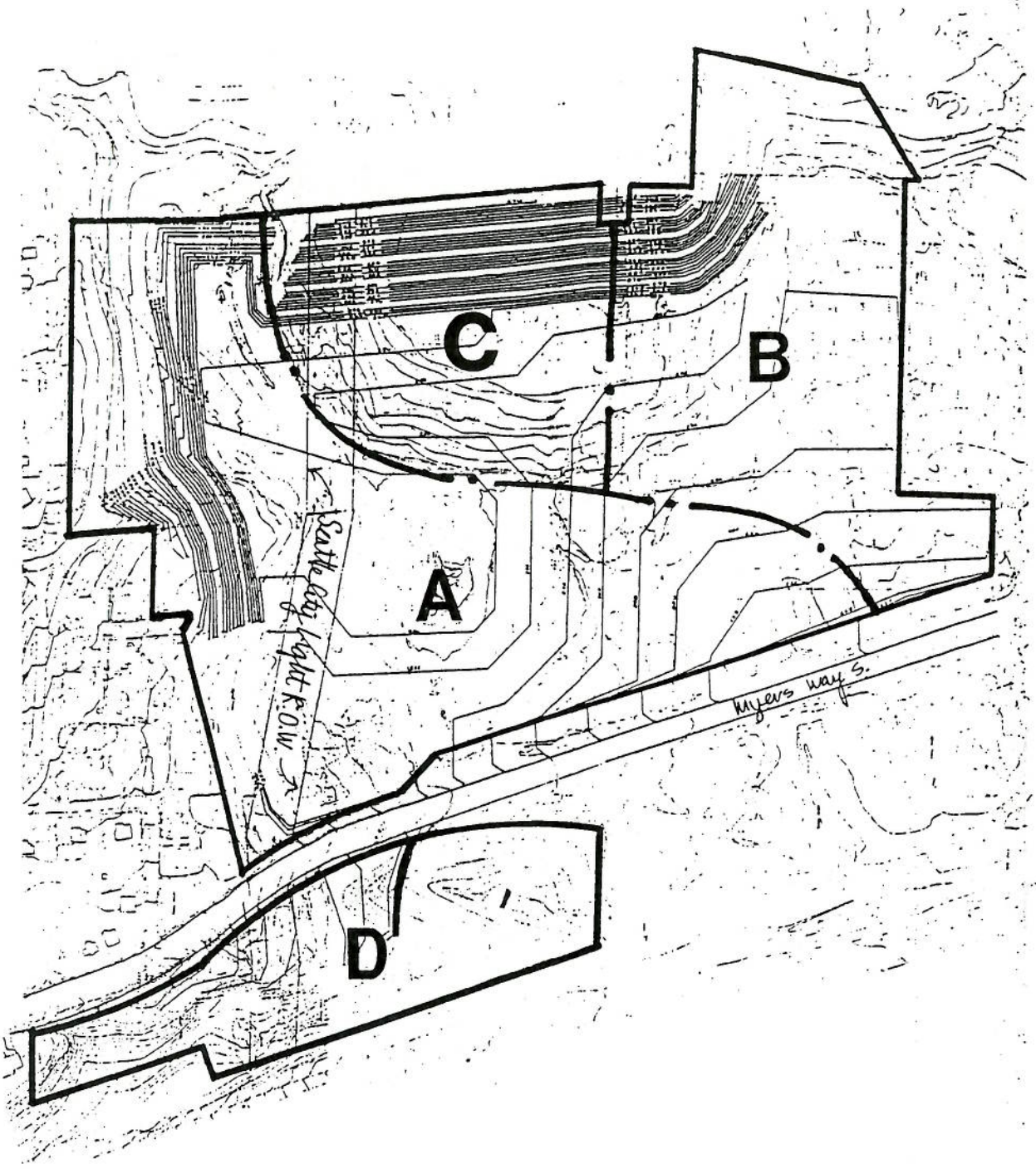
4. Soil Types: The dominant surface soil is Indianola fine sandy loam to depths of 12 inches, according to the 1938 King County Soils Survey. Figure 6 plots the location of subsurface soils on the site. The dominant subsurface soil is medium-dense to very dense sand, underlying about 60 percent of the site to



Notes: Proposed grading uses 10' benches every 25' in elevation. Bench faces are graded at 1½ to 1 (cut) or 2 to 1 (fill).

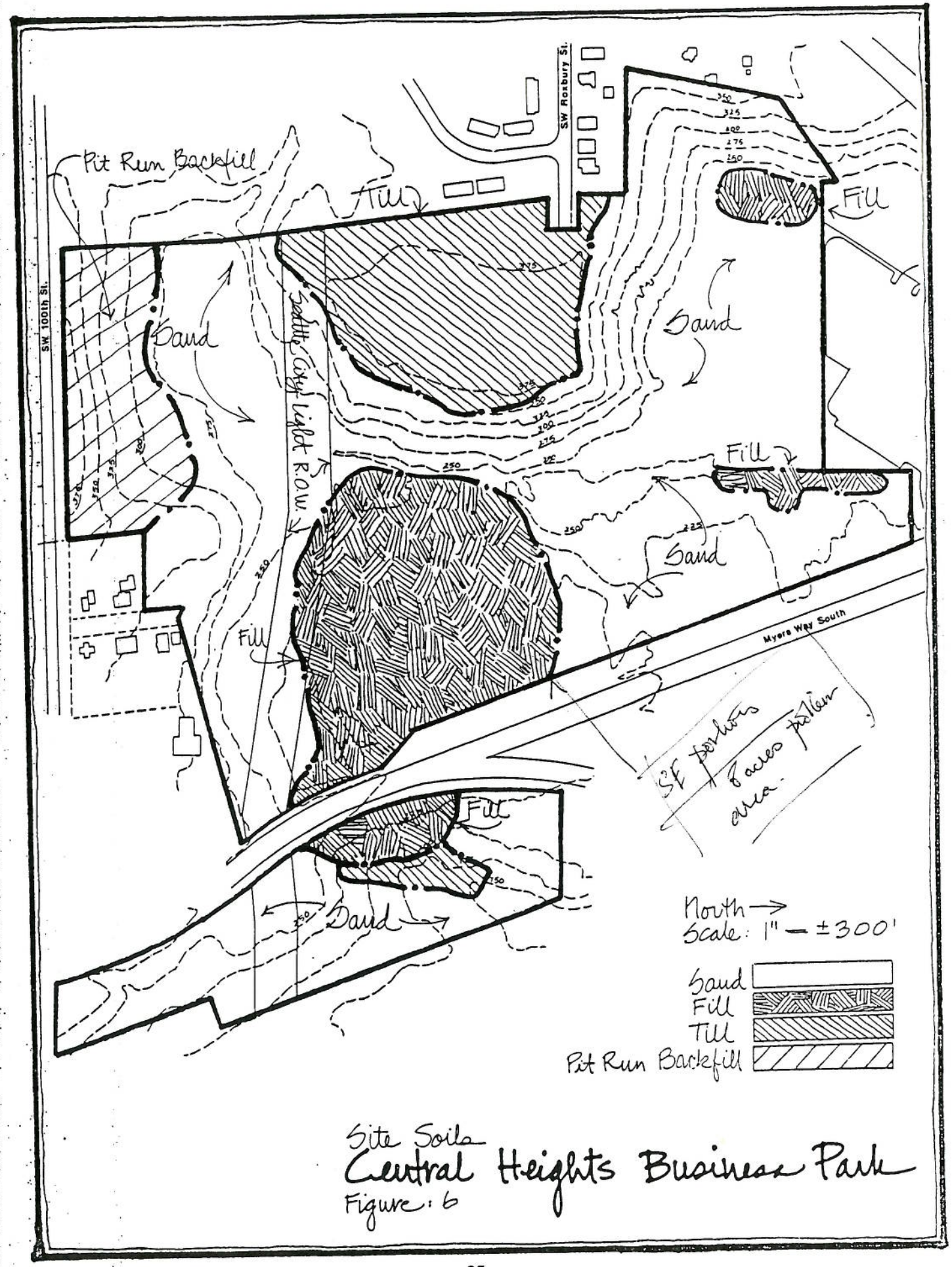
Contour interval on grading plan = 4'.

Existing and Proposed Topography
Central Heights Business Park
Figure: 4



North →
Scale: 1" = ±300'

Plussed Site Restoration
Central Heights Business Park
Figure: 5



Site Soils
Central Heights Business Park
Figure: 6

depths of 180 or more feet. The knoll area (20 percent of the site) is underlain by glacial till, and the south border and southeastern corner of the site is underlain by miscellaneous uncontrolled fill material to depths of 13 feet or more. (Source: Terra Associates, Subsurface Exploration, February, 1985).

Characteristics of the subsurface soils are as follows:

a. Sand. Most of the subsurface sands are medium-dense to dense sands. The sand unit in the knoll area is 180 feet thick, and consists of clean to slightly silty, fine to medium grained sand, considered highly suitable for fill material. The sand unit extends across Myers Way, and is the dominant soil-type on the 7-acre site. The sand is relatively permeable, and is generally firm, dense, and not readily compressible under loading. It will, therefore, offer good foundation bearing support for buildings. The undisturbed dense sand on the site has long-term stability even on 1.5:1 slopes if properly revegetated.

   The soil consultants recommend that construction be based above the ground water table to avoid having to place foundations below the water table, where the sand is relatively unstable. Ground water was observed at depths of 2 to 4 feet below the existing floor of the site. (See also discussion of ground water in Water Resources Section.)

b Till: The till consists of a cemented mixture of gravel, sand and silt. It is quite dense and relatively impermeable, and is not readily erodible by water runoff, and is quite stable in excavations and cuts. The cemented till will offer excellent foundation bearing support for buildings. Till-covered slopes will remain stable for long periods even at up to 1:1 slopes. (No 1:1 slopes are proposed for this project).

c. Fill Areas: The entire southeastern corner (8 acres) of the main site is covered with fill materials to depths of 13 feet and beyond. There is also evidence of shallow filling on the northern end of the site, and a fairly substantial fill area (175 feet by 400 feet) on the small site east of Myers Way South.

   The southeastern fill area and the SW 100th Street fill are problems because their depth and composition are unknown, and because they were placed in an uncontrolled manner. Because the fill areas would very likely undergo uneven settlements, they may not provide adequate support for buildings. For small buildings, foundation support can be provided by excavating a few feet of fill and replacing it with a structural fill mat. Heavier buildings will require

removal of greater thicknesses of fill material and replacement with structural fill. At some point it might be cost-effective to pursue the alternative of buildings supported by piles driven to competent soil.

The shallow fill areas should present no problem since they can be removed down to a firm grade.

5. Slope Stability: The King County Sensitive Areas Map Folio (1982) indicates that the steep cut slopes on the site are included in Seismic Hazard Zone III, implying that some degree of seismic hazard exists. King County Ordinance 4365 defines Class III Seismic Hazard Areas as "Those areas subject to severe risk of earthquake damage due to soils of low density, poorly drained alluvium, highly saturated organic material, or slopes greater than 15 percent". The Sensitive Areas Folio does not indicate any potential for erosion or landslide hazard on the site. The problem is examined in depth in a report Stability Analysis of Cut Slopes (1985) by Terra Associates, and is discussed under "Expected Project Impacts."

6. Expected Project Impacts: There are four major project impacts on soil: the terminal phase of the commercial sand removal program, from 1986 to 1990; the slope stabilization and restoration program, 1986 to 1989; the proposed grading plan; and construction impacts. Both the sand removal and the slope stabilization program involve moving enormous volumes of sand, and will occur simultaneously. Although they are nearly indistinguishable as operations, they work toward totally different goals, as discussed below.

7. Sand Pit Operation - Terminal Phase: Over a period of sixty years, it is conservatively estimated that between 10 and 15 million cubic yards of high-quality sand were removed from this site. During the next five years, 1986 through 1990, the terminal phase of the operation will be completed, involving removal of the remaining 1.3 million cubic yards of sand. This amounts to an average annual removal of 260,000 cubic yards of sand, the volumes fluctuating with seasonal demand for fill material.

The sand pit operation, the slope stabilization program, and the final grading of the entire site require grading permit approval from King County and the City of Seattle. King County may assume responsibility for permit activity on both the City and County portions of the site. For grading and restoration activities, the site was divided into 4 areas. (See Figure 5). Area A includes the southern 15 acres of Parcel 1, the sedimentation control features adjacent to Myers Way South, and the frontage upon that arterial. This Area A is that affected by the renewal of the existing grading permit #2513-33. Area B is substantially the portion of the site currently within the City of Seattle. Area C is the County portion of Parcel 1 subject to the

acquisition of an Unclassified Use Permit prior to obtaining the requisite grading permit. Area D covers the topographical changes relating to the ultimate development of Parcel 2. It is not a part of the historic excavation activities. Applications for Area A and Area C grading permits were submitted on December 19, 1984 and March 12, 1985 respectively, and both are awaiting approval.

The sand pit operations will be limited as follows: On the county portion between 8 AM and 5 PM; on the City portion from 9 AM to 4 PM. Both portions will be operated on weekdays only. The sand pit will operate for not more than 240 days each year. On a typical weekday, the site will generate 100 to 110 truck trips daily (55 in, 55 out) or a total of 14 trips per hour (7 in, 7 out).

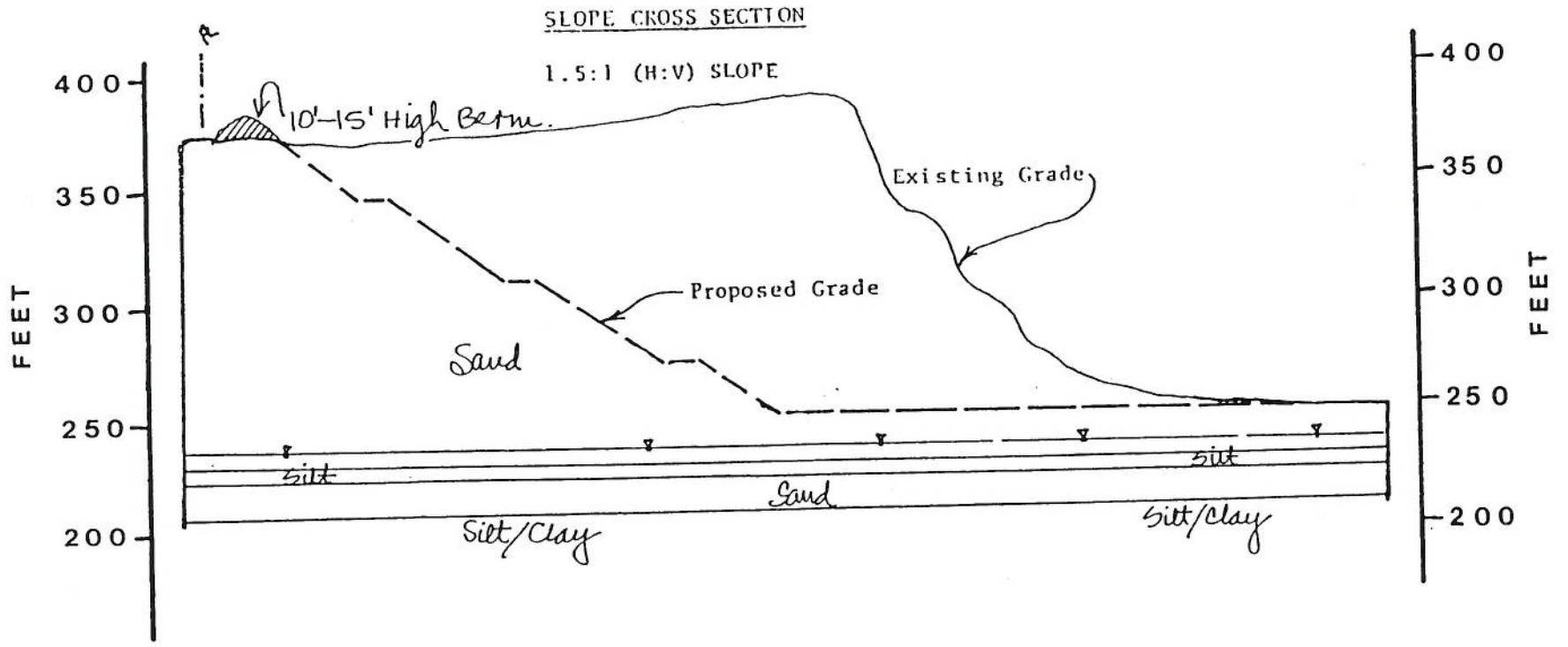
During periods of peak demand, the site will generate up to 220 truck trips daily (110 trucks in, 110 trucks out). This amounts to a total of 28 truck trips hourly (14 trucks in, 14 trucks out). This level of activity requires each truck to be loaded within 4 minutes. A large truck with trailer can carry 18 cubic yards, or 80,000 pounds, of sand. Typical volumes of sand removed during average and peak demand days are as follows:

	No. of Trucks Daily	No. of Yards Delivered	No. of Days Needed to Deliver Annual Quota
Average Day	55	990 CY	262 Days
Peak Day	110	1,980 CY	131 Days

Under the peak demand conditions, the estimated annual removal of 260,000 cubic yards could be accomplished in 4.2 months. Under average demand conditions, the material could be removed during the 240-day work year. (Since the delivery of sand is also a transportation issue, see discussion of truck-trip generation in the Transportation Section.)

8. Slope Stabilization: The reference for discussions of slope stability is the King County Sensitive Areas Map Folio (1982) which includes all cut slopes on the site in Seismic Hazard Zone III, indicating that some degree of seismic hazard exists. The Folio does not indicate any potential for erosion or landslide hazard on the site.

The study of the slope stability of existing undisturbed dense sand is included in a February, 1985 report Stability Analysis of Cut Slopes, South Slope, Duwamish Heights by Terra Associates. Two slope conditions -- 1.5:1 and 2:1 - were subjected to computer analysis. With factors of safety for both static and seismic conditions, the Soils Consultants recommend a 1.5:1 slope as providing the needed slope stability for cuts in the undisturbed dense sands. Figure 7 profiles a typical slope design.



Profile of Existing and Proposed Slope
Central Heights Business Park
Figure: 7

Depending on an area's respective soil condition, there are in fact three different proposed design slopes. In the southwest portion of the site near the west property line (where shallow surface slips and erosion channels have occurred), a slope of 2:1 is proposed, with appropriate benching. This is because the soil there is an imported pit run material placed by previous owners, without compaction, as back-fill in an over-excavated area. In addition, no drainage measures, slope revegetation or stabilization were accomplished at that time, since it had not reached design grade. When it is cut to design grade under the current plan, comprehensive drainage and revegetation measures will be completed.

Through the input of the Seattle Water Department, there is an area in the southwest portion of the site that has been designed at a 3:1 slope. The desire to protect the 48" pressure main located in the right-of-way of SW 100th Street, in conjunction with the adjacent bank of imported, uncompacted pit run material, dictate this standard where shown.

A third design slope proposed is 1.5:1 in areas where no unusual engineering condition exists, and where the soil is composed of the original, undisturbed, dense native sands. Both the soils engineers and hydroseed specialists consulted believe this slope is appropriate under the above conditions.

The consultants recommend that the slopes be interrupted at 25 foot intervals by 10 foot wide benches. The benches are designed to collect water flowing down the slopes. Since the sand has very few "fines" or binder, "gullying" can occur as water flows down the slopes.

The most likely mode of failure on these slopes is surface sloughing, where shallow planes of soil 6 to 24 inches slide across lower strata. A healthy growth of vegetation with strong root structures is recommended to prevent surface sloughing.

9. Proposed Grading Plan: The proposed site grading is shown on Figure 4.

10. Phase III Construction Impacts: Excavations for building foundations and utilities represent the major impacts on soils. These impacts must be treated generally since no building site configuration or utility plans have been prepared.

Since all utility and foundation work will involve excavations, the main question is, what problems will be encountered in the three site soil types? Till offers excellent bearing support for buildings, is not readily erodible, and is quite stable in excavations and cuts. Excavations with up to 1:1 slopes will remain stable for long periods, although none are proposed for this project. Till is acceptable as fill material when worked in dry weather.

Sand, the major soil on the site, offers good foundation support for buildings. Sand is relatively stable on cuts and excavations, provided the excavations are above the water table, which is between 2 to 4 feet below existing grade. Sand can be worked in damp weather, if the soil is not saturated. Buildings with foundations below the water table will employ soil dewatering techniques (trenches, wells, pumps) as required.

Fill areas are questionable for foundation support. Where fill areas are shallow, the obvious solution is to remove the fill. In the southeastern corner of Parcel 1, where the fill is 13 or more feet deep, the solution depends on the problem encountered. It is of course possible to replace the uncontrolled fill with structural fill. At some point it may be more cost-effective to construct deep foundations to stable soils. The site fill is moderately erodible, and sloughing will occur when the fill is saturated. Soils engineers will be consulted and their recommendations followed.

In areas where excavations must be located below the ground water level, special provisions may also have to be made for drainage and dewatering.

11. Mitigation Measures

a. All cut slopes will be compacted and regraded with 10-foot wide benches at 25-foot intervals.

Depending on an area's respective soil condition, there are in fact three different proposed design slopes. In the southwest portion of the site near the west property line (where shallow surface slips and erosion channels have occurred), a slope of 2:1 is proposed, with appropriate benching. This is because the soil there is an imported pit run material placed by previous owners, without compaction, as back-fill in an over-excavated area. In addition, no drainage measures, slope revegetation or stabilization were accomplished at that time, since it had not reached design grade. When it is cut to design grade under the current plan, comprehensive drainage and revegetation measures will be completed.

With assistance from the Seattle Water Department, an area in the southwest portion of the site has been designed at a 3:1 slope. The desire to protect the 48" pressure main (located in the right-of-way of SW 100th Street) in conjunction with the adjacent bank of imported, uncompacted pit run material, dictates this standard where shown.

A third design slope proposed is 1.5:1 in areas where no unusual engineering condition exists, and where the soil is composed of the original, undisturbed, dense native sands.

Both the soils engineers and hydroseed specialists consulted believe this slope is appropriate under the above conditions.

b. All new slopes and benches will be hydroseeded to provide slope stability. The 60 x 60 foot test area was seeded with different mixes in spring 1985 to determine their relative merit for holding the soil. The results indicated that the D.O.T. standard seed mix of rye and clover, with the standard fertilizer, extra mulch and a tacking agent would be successful. Also, time of year and dryness of the weather were found to affect early growth. Selected plantings of trees will also be accomplished.

c. All haul roads on the site should be designed to have grades of 5 percent or less.

d. All proposed building sites having more than a 5 foot depth of uncontrolled fill material will be evaluated to determine what remedial measures are needed to provide stable foundation support.

e. All work will be done under directions from Soils Engineers.

e. Dewatering and drainage plans will be developed for foundation work below the ground water level.

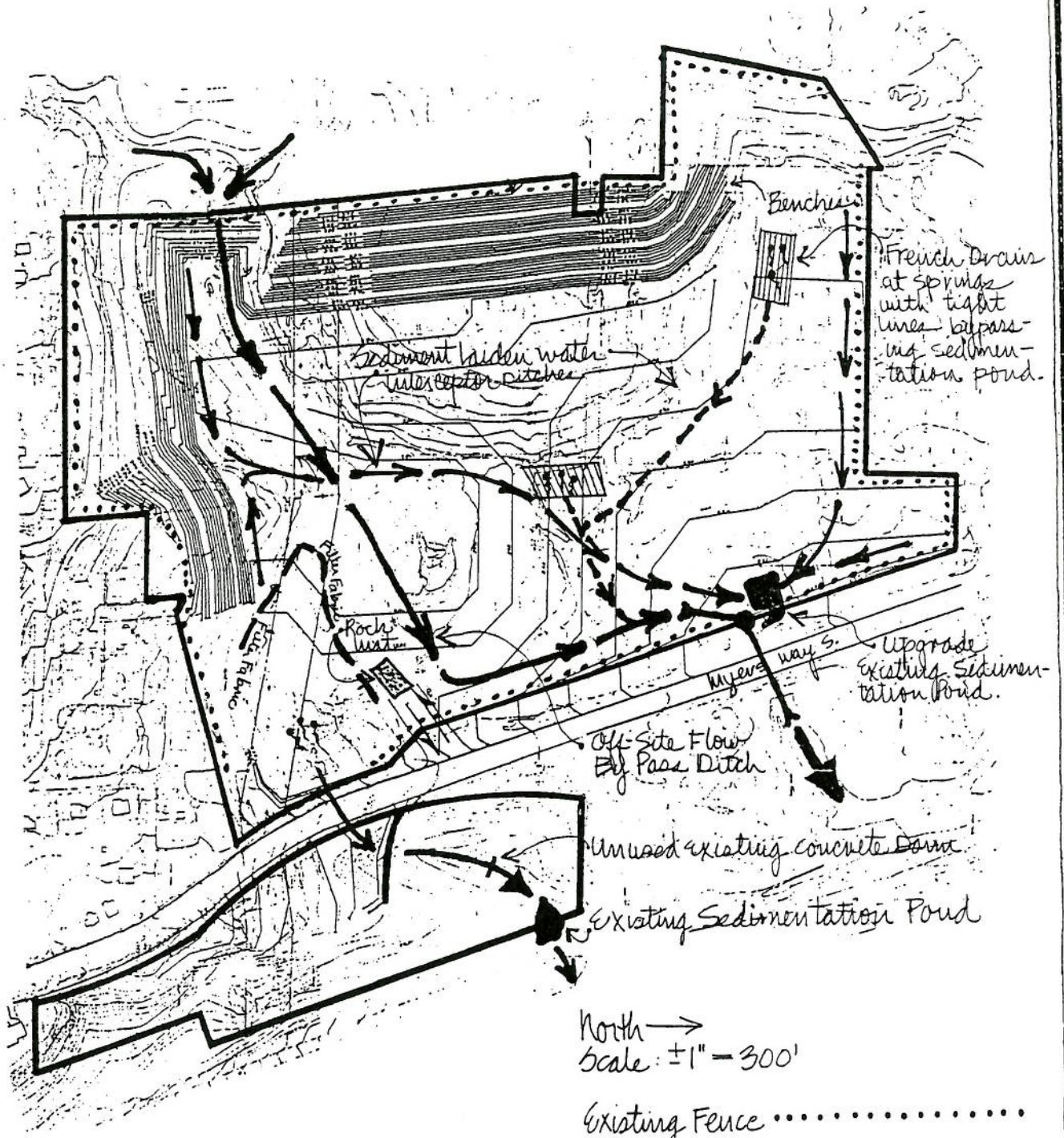
f. Excavation work in fill areas should be limited to dry or damp periods. Fill should not be worked when soil is saturated.

g. During construction, erosion control measures will be implemented as discussed further under Water Resources.

B. Water Resources

1. Existing Conditions

a. Surface Water: Two seasonal watercourses from separate ravines west of the subject property combine and enter the site in a 36" corrugated pipe along the western property line in the southwest corner of the site (Figure 8). A ten-year flow through this system is projected at approximately 37 cubic feet per second for wet antecedent conditions. Historically this off-site runoff continued into the ravine lying in the southeastern portion of the property. It then flowed through a 3' x 4' box culvert beneath Myers Way South, and into the ravine's continuation in the approximately 8 acres of the site lying east of Myers Way South and west of SR 509. These waters were partially impounded at that point by a concrete dam which held them for agricultural use in the valley below. Decades of soil disruptions from the commercial sand pit operations have altered all historical flows



Erosion Control Plan
Central Heights Business Park
Figure: 8

within this site. The only present flow through the ravine east of Myers Way South is the runoff from the ravine sides and about 1 cfs flow from springs in the wall of the ravine west of Myers Way South. At the bottom of the ravine, the flow is piped under SR 509. It then flows into the King County storm water system aligned generally with South 96th Street and then into the Duwamish River. This system across the valley floor currently experiences capacity problems. Currently the corrugated pipe entering the site on the west flows into a sedimentation pond measuring approximately 25' x 250'. This pond was built in 1982 to handle runoff from the restoration of the cut slopes on the southeastern corner of the site, as well as the adjacent slopes of the King County Housing Authority property. From this old pond, it presently runs into a small ditch running due east along the existing entrance road, then due north along the east property line to the old sedimentation pond next to Myers Way South, at the northeastern corner of the property. It has a water surface elevation of approximately 219 feet. This pond was created after the extension of First Avenue South and realignment of Myers Way South were completed in 1968. The ponded water drains into a concrete manhole adjacent to the existing sedimentation pond, and drains beneath Myers Way South in a 24" corrugated metal pipe tight line into the drainage system of SR 509. After it passes under SR 509 it enters a City of Seattle combined sewer. This combined sewer has no record of under-capacity for its current flows. In addition, a storm trunk collector line for this area of the valley floor is proposed by the City of Seattle.

Prior to 1983, the sedimentation pond near Myers Way South collected "fines" from the whole site west of Myers Way South resulting from earthwork and terrain changes. It has been less active in the past two or three years because the site was not being worked. This lack of maintenance has allowed vegetation to be re-established in this wet area. Another major sedimentation pond was eliminated in the construction of the Park & Ride Lot site in the northern angle of Olson Place S.W. and Myers Way South in the 1970's. It is clearly visible in air photos of the site prior to 1968. A large wall photo of the Seattle area dated April 1967 shows these ponds. A copy of this photo is on display in the Engineering Department on the 9th floor of the Seattle Municipal Building.

b. Ground water: The site springs and ground water resources are discussed in the Hart-Crowser Ground water Study (1980) and in Terra Associates' Subsurface Exploration (1985). The locations of all flowing springs are shown in Figure 8. Springs originating in the southeastern ravine are currently the only waters flowing into the main site drainage line, which is the box culvert beneath Myers Way South. Their typical discharge is approximately 1.0 cfs or less, and their elevation is at approximately 220 feet. They do not flow through cut slopes or bare earth and are therefore not carrying significant sediments

or "fines". The ravine is precluded from taking surface water flows by a barrier constructed for this purpose under the guidance of King County Surface Water Management. Springs originating at the easterly toe of the central hump of sand at an approximate elevation of 242 feet, flow from their source northeasterly to the Myers Way South sedimentation pond, discharging approximately 0.75 cfs. Springs originating from the sections of the site north of the central sand hump flow from elevation 250 eastward along the south border of the Park & Ride Lot, and then under Myers Way South. They discharge typically less than 1.0 cfs.

The ground water table is relatively shallow beneath the general site grade. Ground water seepage and flowing springs originate in areas cut beneath the varying levels of the ground water table. Its level slopes downward from west to east, approximately 2 to 4 feet beneath the existing grades.

c. Storm Runoff and Absorption: The rate of storm water runoff and absorption capability of the site itself is dependent on soil conditions, topography, and vegetative cover. The volume of surface water runoff is dependent on the intensity and duration of storms and the ability of the site to absorb runoff. It is estimated that 40 percent of the site is less than 5 percent grade with sparse trees and ground cover; the remaining 60 percent is more than 5 percent grade with sparse trees and ground cover. During a 25-year storm, it is estimated that the rate of storm runoff on the existing site would be 3.82 cfs, while a 25-year storm on the developed site gives an estimated runoff of 17.67 cfs, using average antecedent conditions. This reflects the decrease in infiltration on the site as approximately 44.6% of its area is paved or built upon. A lesser contributing factor is the change in critical time of concentration (TOC) due to the faster flow of surface runoff over paved surfaces than bare ground. In addition to the above flows, based upon the contributing area of the site itself, an additional 150 acres (more or less) of developed land above the site to the west and south contribute to the net flows leaving the site. The off-site generated flows result in an additional 21.31 cfs leaving the site during a 25-year storm, using average antecedent conditions. Thus, the net before and after development flows leaving the site are 25.13 cfs and 38.98 cfs respectively.

The site's sandy soils readily absorb most rainfall, and there is little standing water on the site. The site is not in a flood plain.

2. Expected Impacts

a. Surface Water: The Phase II sand removal and slope restoration would have no impact on storm water runoff, since the soil conditions and vegetative cover would remain practically unchanged. No impervious surfaces would be added.

During the Phase III business park development, an estimated 44.6 percent of the site will be converted to impervious areas, including roofs, streets, sidewalks, and parking lots. A summary of impervious areas by category is shown in Table 1.

TABLE 1
IMPERVIOUS SURFACES, CENTRAL HEIGHTS SITE

		Impervious Areas (SF)
1.	Building Footprint Areas	15.53 Acres = 676,428 sf
2.	Parking, Vehicle 605 Spaces + lane	4.07 Acres = 177,289 sf
3.	Parking, Truck 40 spaces (25' x 50')	1.51 Acres = 65,776 sf
4.	Entrance lanes, all vehicles	1.44 Acres = 62,800 sf
5.	Public Roads	1.61 Acres = 70,000 sf
6.	Sidewalks (Estimated)	0.73 Acres = 31,900 sf
	TOTAL IMPERVIOUS AREA	24.89 Acres = 1,084,193 sf

	Parcel 1	Parcel 2	Total
Open Space	25.05 (51.3%)	5.92 (83.9%)	30.97 (55.4%)
Impervious	23.75 (48.7%)	1.14 (16.1%)	24.89 (44.6%)
TOTALS	48.80 (100%)	7.06 (100%)	55.86 (100%)*

* Inclusive of City Light Right-of-Way.

To determine the storm runoff, it was estimated that 4 percent of the site would be used for the research and development site with grades under 5 percent; 45 percent would be used for the business park, with grades under 5 percent; the remaining 55.4 percent is assumed to be open space and landscaping.

The surface water runoff will be handled differently in Phases II and III. During both the Phase II site restoration and the construction of the Phase III business park, all surface flows will be handled essentially as they have been in the recent past,

with drainage ditches and a sedimentation pond. The existing sedimentation pond, renovated per King County standards, would act as an interim detention pond during this time, and would be fitted with a restrictor device.

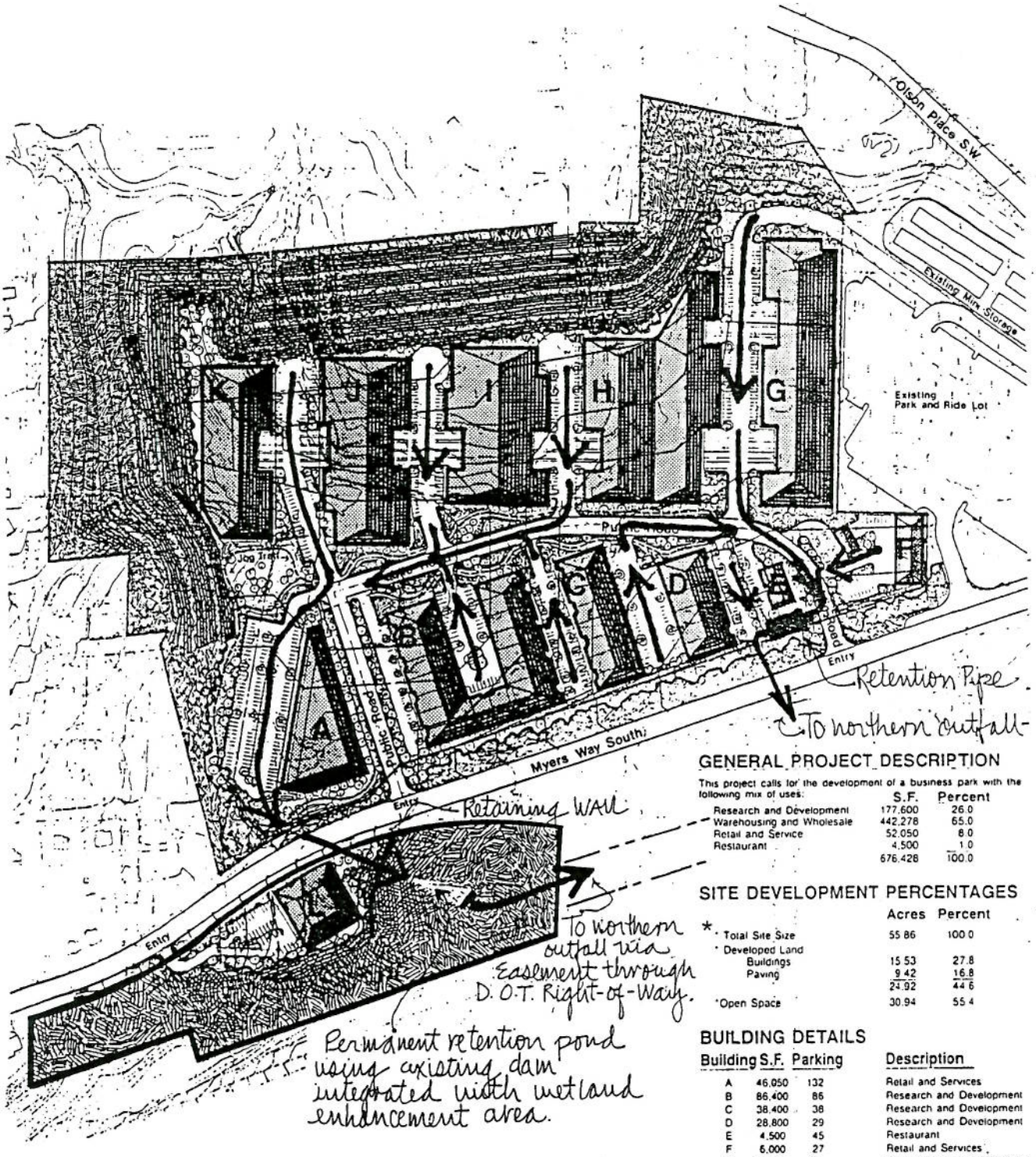
The current Erosion and Sedimentation Control Plan, submitted with the November 1985 grading permit application for Phase II work recommends improving the ditches and improving the sedimentation pond to current King County standards. The entire system would continue to flow from the sedimentation pond into the existing pipe culvert under Myers Way South. All clean flows would be kept separate from the sediment-laden flows and would be led directly into the storm manhole next to Myers Way South. These clean waters include major off-site flows and water from the springs to the east of the hump. Eventually the springs from the north side of the hump may be collected and routed to the manhole as that area is developed.

This entire open drainage system will remain operational until Phase II is completed, and will be retained where needed during construction of the business park, then discontinued.

With final grading and paving of Parcel 1, a permanent storm drainage system will be installed on Parcel 2, as shown on Figure 9. Catch basins and tight-lines will pick up surface waters and convey them to a 50' deep collecting manhole in the southeast corner of the site. From there they flow through a box culvert under Myers Way to a detention pond on Parcel 2, at the location of the existing concrete dam. From this detention pond, waters are proposed to flow in tight lines northerly through an easement to be obtained from D.O.T. These waters will rejoin existing points of release. D.O.T. will require approval of any and all retention/detention areas in proximity to SR 509.

An alternative to the above involves the placing of the detention pond in the ravine just east of the existing sedimentation pond, north of Parcel 2, and also lying between Myers Way South and SR 509. Since this is D.O.T. property, detailed designs and agreements would be necessary for its implementation. If implemented, this alternative has no impact beyond the subject property or the D.O.T. property. It is mentioned due to the lack of detailed soil information for the foot of these ravines. Prior to final selection, detailed soils and hydraulic analyses will be conducted.

In either case, after passing under SR 509, the storm flows enter a City of Seattle combined sewer, which at present experiences no known capacity problems. A new storm trunk collector, (7th Avenue South storm drain) is to separate sanitary sewer from storm waters in this area, and is planned to be built in concert with the METRO Renton Effluent Transfer System pipeline. It should be in place before the construction phase three of the project commences.



GENERAL PROJECT DESCRIPTION

This project calls for the development of a business park with the following mix of uses:

	S.F.	Percent
Research and Development	177,600	26.0
Warehousing and Wholesale	442,278	65.0
Retail and Service	52,050	8.0
Restaurant	4,500	1.0
	676,428	100.0

SITE DEVELOPMENT PERCENTAGES

	Acres	Percent
* Total Site Size	55.86	100.0
* Developed Land		
Buildings	15.53	27.8
Paving	9.42	16.8
	24.92	44.6
*Open Space	30.94	55.4

BUILDING DETAILS

Building	S.F.	Parking	Description
A	46,050	132	Retail and Services
B	86,400	86	Research and Development
C	38,400	38	Research and Development
D	28,800	29	Research and Development
E	4,500	45	Restaurant
F	6,000	27	Retail and Services
G	96,271	34 8 truck bays	Warehousing and Wholesale
H	118,982	76 12 truck bays	Warehousing and Wholesale
I	81,750	41 8 truck bays	Warehousing and Wholesale
J	81,450	41 8 truck bays	Warehousing and Wholesale
K	63,825	32 4 truck bays	Warehousing and Wholesale
L	24,000	24	Research and Development
	676,428	605 car spaces 40 truck bays	

LENGTH OF PUBLIC ROAD DEVELOPMENT

	1,860 feet
Pavement Width	40 feet
Right-of-way Width	60 feet

LENGTH OF WALK/EXERCISE TRAIL

3,600 feet

North →
Scale: 1" = 300'
Direction of Water Flow →

Permanent Storm Drainage Plan
Central Heights Business Park
Figure: 9

* TOTAL SITE SIZE INCLUDES CITY LIGHT RIGHT-OF-WAY

When final grading and paving are complete on the research and development center site on Parcel 2, a permanent storm drainage system will conduct its flow to the detention pond.

b. Ground Water

Underground springs exist at the toe of the central knoll. During Phases I and II they will be temporarily collected in pipes and led directly to the storm manhole adjacent to the sedimentation pond. When the permanent storm system is installed, the springs will be diverted into the new storm sewers. Similar springs, located in the southeastern ravine, will be handled likewise when the ravine is filled. Special care will be taken to prevent soil saturation of the Myers Way South embankment.

3. Mitigation Measures

a. During sand removal and construction of the business park, an approved Erosion and Sedimentation Control Plan will be in effect.

b. All slopes will be hydroseeded as soon as possible within 60 days of the end of any earthwork (allowing for weather). Final revegetation plans will include special hydroseed mixes with wildflower, tree and shrub mix. In appropriate areas (benches, etc.) seedling conifers will be placed.

c. Filter fabric fences will be placed around the southeastern ravine to prevent siltation during construction and sand removal.

d. Due to tight-lining spring flows, the groundwater table may be lowered a fraction of a foot, if that much. No downstream properties would be significantly impacted by this, since they all lie 100 to 200 feet below the site and are commercial properties.

C. Air Quality

Most of the technical information in this section is summarized from a report Air Quality Study of Central Heights Property prepared by Hal Alsid, Air Quality Consultant of Enumclaw, Washington in April, 1985. Air quality information was also gleaned from Air Quality Data Summaries published by the Puget Sound Air Pollution Control Agency.

1. Air Quality Standards: The Clean Air Act of 1970 established national ambient air quality standards for seven pollutants: lead, photochemical oxidants (Ozone,), Carbon Monoxide (CO), Total Suspended Particulates (TSP), Oxides of Nitrogen (NO_x), Non-Methane Hydrocarbons (HC), and Sulfur Dioxide (SO_2).

The State of Washington also established air quality standards in 1969 for the above-named pollutants. These standards are administered in the South Park neighborhood by the Puget Sound Air Pollution Control Agency (PSAPCA). With the exception of Sulfur Dioxide (SO_2), all the named air pollutants are pertinent to the Central Heights property.

The 1977 Amendments to the Clean Air Act of 1970 require that air quality does not deteriorate any further in a non-attainment area. This requirement is pertinent to this site because the northern (City) portion of the site is an a "Non-Attainment Area for Suspended Particulates". The southern portion of the site is in an "Attainment Area for Suspended Particulates". Until recently, the South Park neighborhood was also included in a Non-Attainment Area for photochemical oxidants, Hydrocarbons and Oxides of Nitrogen. However, an absence of oxidant violations prompted the PSAPCA Board of Directors to request removal of the Non-Attainment status for the Puget Sound area. The site is in an Attainment area for Carbon Monoxide.

The intent of the 1977 Amendments to the Clean Air Act is that air quality not deteriorate any further in a Non-Attainment Area, and that states develop plans to reduce levels of pollutants in non-attainment areas and comply with standards by 1987. Therefore, new development on portions of the Central Heights site could be required to prove they are not contributing to pollution within the Non-Attainment area, and if they are contributing to the problem, they could be required to add extensive particulate controls. All pertinent air quality standards are included in Appendix D.

2. Existing Conditions: For the past decade (possibly longer) the South Seattle Industrial District has had air quality problems, resulting from dust, industrial stack emissions, and other industrial particulate emissions. The area also has problems meeting standards for carbon monoxide and ozone. For these reasons, the Puget Sound Air Pollution Control Agency designated the entire industrial area as a "Non-Attainment Area for Suspended Particulates".

Air Quality within the proposed Central Heights site can best be assessed by reviewing the annual reports prepared by the State and regional air pollution control agencies. The Washington State Department of Ecology (DOE) and PSAPCA have established monitoring stations throughout the Puget Sound area to collect air quality data.

The closest monitoring station - South Park - located at 723 S. Concord Street, is 1/2 mile north of the project. Another station - Duwamish Valley - is located at 12026 42nd Avenue South, two miles southeast of the project. Information collected at these stations consists of suspended particulate and size

distribution data. Tables showing the concentrations at each station as well as 6-year trends are included with the discussion of each pollutant.

a. Suspended Particulates: Suspended particulates result from industrial processes, auto traffic, and windblown dust. The six-year trend (1979 to 1984) at the two stations nearest the project site indicates a general improvement in air quality as shown on Table 2.

TABLE 2
TOTAL SUSPENDED PARTICULATES AT THE AIR QUALITY MONITORING SITES

	Annual Geometric Mean (UG/M^3)						
Station	1979	1980	1981	1982	1983	1984	STATE STANDARD
South Park #1776K61B	60	53	53	44	45	46	60
Duwamish Valley #1700K59B	58	51	55	40	42	48	

Source: Washington State Air Monitoring Data for 1983

Concentrations have remained within acceptable limits for six years. The improvement may be due to: better maintenance of pollution abatement equipment, increased use of unleaded gas, and discontinuance of industries with high pollutant output. On the other hand, the 24-hour average of 150 ug/m^3 was violated once at each station in 1984. South Park (K61B) reported a value of 157 ug/m^3 on March 7, 1984, and Duwamish Valley (K59B) reported a value of 211 on January 19, 1984.

The fact that the City portion of the site is in the Non-Attainment Area for suspended particulates may not be important at this time because the only activity proposed in the next few years is sand removal. Since that is a continuing, rather than a new operation, no additional particulate controls will be needed. Mitigation measures are recommended in a later section.

b. Photochemical Oxidants, Hydrocarbons, and Oxides of Nitrogen: Photochemical Oxidants (Ozone) are produced in the atmosphere when hydrocarbons and oxides of nitrogen react in sunlight. In Western Washington, days that produce this condition exist for only short periods of time during the summer. Violations of the photochemical oxidant standard led Puget Sound Air Pollution

Control Agency to designate the entire Puget Sound region as a Non-Attainment area for oxidants. However, the absence of violations prompted PSAPCA to request removal of the Non-Attainment status. There is no monitoring of photochemical oxidants near the site.

c. Carbon Monoxide: Carbon Monoxide is generated in the South Park neighborhood by gas-powered vehicles. Violations of CO standards occur mainly in Seattle's Central District. The project site is located in an Attainment Area for CO.

3. Expected Project Impacts. The proposed action involves three phases: (1) annexation and rezone of the southern 41 acres of the site; (2) sand removal and regrading the entire site; and (3) development of a Master Plan for a business park and the research and development site on Parcel 2.

Phase I - Annexation and Rezone - will have no impact on air quality. Phase II - Sand removal and regrading the site - will generate two types of impacts: dust associated with the pit operation (loading dump trucks) and vehicle emissions from trucks going to and from the site. Phase III - development of a business park and a 2-acre research and development site - will generate 11,000 vehicles daily, increasing concentrations of the following emissions: carbon monoxide, nonmethane volatile organic emissions (voc); and oxides of nitrogen.

a. Phase II Impacts: For the next five years the major site activity affecting air quality will be sand removal from the high knoll area on the western edge of the site. It is estimated that an average of 260,000 cubic yards will be removed in each of the next five years. This amounts to 50 truckloads of sand being removed on an average work day, and 100 truckloads on a peak day. Sand removal of course depends on contracts to purchase the material.

The two major pollutants generated during Phase II are particulates and vehicle emissions. Airborne particulates are created by movements of site materials, including sand and silt, which is described as follows:

Material	Size	Minimum Settling Velocity
Fine Sand	20 to 250 microns	10 - 100 cm/sec
Silt	6 to 20 microns	6 - 10 cm/sec.

Because of its greater mass, the sand settles out at a velocity 2 to 10 times greater than the silt particles.

Most dust during the pit operation is generated when dump trucks are being loaded. Thus, the particulates will become airborne at a height of 10 feet above the ground. Wind velocity and direction determine where particulates are deposited. Wind rose data from nearby air monitoring stations indicates that north winds occur about 30 percent of the time at a typical wind speed of 10 knots. North winds will carry any dust generated by loading and hauling to the southeast. South winds, when they occur, will carry dust downhill toward the north.

The total impact of airborne dust generated by the truck loading operation is that most of the silt particulates will settle out within 800 feet of the loading point (worst case day). Most of the fine sand particles will settle out within 200 feet of the loading point.

No standard EPA emission factors are available for a front-end loader operation and therefore annual tonnage estimates are not included in this study. Emissions from this work will be less than previous operations with installation of new particulate controls as outlined in the mitigating section. (Source: Alsid & Associates, Air Quality Study, Central Heights Property, April, 1985).

Vehicle emissions are generated by truck operations which emit carbon monoxide, oxides of nitrogen and hydrocarbon. Based on emission factors from the MOBIL 3 emission model, emissions were predicted using a 1 mile segment of Myers Way in front of the site as shown in Table 3. Truck emissions were compared to existing traffic along this section of road using an average daily traffic of 4,800 vehicles.

TABLE 3
VEHICLE EMISSIONS
(kilograms/day)

Compound	Trucks	Existing Traffic
Carbon Monoxide	3.3	92
Hydrocarbons	0.87	17.4
Oxides of Nitrogen	3.2	21.3

Table 3 shows that emissions from trucks are small compared to emissions from the overall traffic. The table shows not an increase in emission, but rather the relative portion of past and present emissions that are assignable to the sand-removal operation. (Source: Alsid & Associates, 1985).

b. Phase III Impacts: The Traffic Study indicates that the business park and the 2-acre research and development center on Parcel 2 will generate approximately 11,000 vehicles daily, increasing concentrations of carbon monoxide, nonmethane voc, and oxides of nitrogen. To determine the levels of carbon monoxide, the strategy was to pinpoint two worst case arterial situations in which high traffic volumes combined with traffic delays would create higher levels of carbon monoxide. The entrance driveways to the business park were considered to have the best likelihood of generating measurable levels of carbon monoxide.

Wind Speed	1 meter per second
Weather Conditions	D Stability 50% of time F Stability 50% of time
Vehicle Speed	35 mph on Myers Way South 15 mph at Access Driveway, Business Park
Temperature	42° F.
Background CO levels	2 parts per million[1]

[1]Alsid & Associates, 1985.

One receptor was placed at each access driveway to the proposed business park. The results, shown on Table 5 of the consultant's report, indicate a concentration of 3 ppm at both receptors, which is considerably below the 9 ppm (8-hour average) concentration permitted by State Air Quality standards.

Two other pollutant concentrations, nonmethane voc and oxides of nitrogen, were also estimated, assuming that the 11,100 site-generated vehicles would travel a two-mile distance from the site at an average speed of 35 mph.

Non-Methane Volatile Organic Emissions:
11,100 vehicles x 2 miles x .0021 kg/mile = 46.6 kg/day

Oxides of Nitrogen Emissions:
11,100 vehicles x 2 miles x .0026 kg/mile = 57.7 kg/day

Both emissions are considered small when compared with the overall emissions of both pollutants in the area.

c. Suspended Particulates. In our previous discussion of Phase II impacts, airborne suspended particulates were considered a major impact, mainly because of the volume of earth work and truck-loading, and the unimproved nature of the site.

Although similar conditions will prevail during the initial construction phase of the business park, the permanent impact of the business park will be to cover 44.6 percent of the site with impervious materials. Another 10-15 percent of the site includes the restored cut slopes which will be hydroseeded. The great

benefit of these improvements will be to nearly eliminate the airborne dust problem on the site. The suspended particulate level during the height of Phase II activities (in mid-1988) will be reduced to almost nothing when the business park is fully operational in 1997.

4. Mitigation Measures for Phase II Activities.

   a. Dirt removal equipment will be installed to remove dirt from truck wheels. Public streets will be cleaned as necessary.

   b. All on-site roads will be treated to reduce wind-blown dust, especially during dry months.

   c. All terraced hillsides will be hydroseeded.

   d. The site is subject to all regulations of PSAPCA.

   No mitigation measures are needed for Phase I and III activities.

D. Plants

1. Existing Conditions. Extensive mining of Parcel 1 for over six decades has created a fairly level "pit floor" area at the center of the site, surrounded by fairly steep slopes on the perimeter. Two other prominent and relatively undisturbed features of the site are the ravine on the southeastern corner and the top of the high knoll on the west-central portion of Parcel 1.

   The floor of the site is generally barren of trees, but patches of grass and clover thrive on the level portions.

   Trees thrive mainly in the ravine and on the high knoll areas, and generally along the perimeters of the site, in large part because despite decades of intense mining, the perimeter areas have remained relatively undisturbed.

   The only mature trees on the site are the 20 to 30 mature madronas on the high knoll. Most of the perimeter trees are scrubby alder, shrub-willow, hemlock, maple and hardhack, with a ground cover of evergreen, red elderberry, blackberry, scotch broom and native sword ferns.

   Some of the slopes on the western edge of the site (below the King County Public Housing site) have been restored to a stable 2:1 slope with hydroseeding. When the new grading permits are approved by the County, all the remaining slopes will be hydroseeded after they reach design grades.

   Most of Parcel 2 has steep slopes (16 to 35 percent) with many of the same types of deciduous and coniferous trees found on Parcel 1.

2. Expected Impacts. Site development on Parcel 1 will eliminate the existing vegetation in the ravine area and on the knoll area. This disruption will remove all the mature madronas on the knoll. The ravine will be filled in to bring it up to the general elevation of the pit floor area (elevation of approximately 250). All ground cover on the pit floor will also be removed. The site development will not affect trees and shrubs within 20 feet of any property line, except to accommodate site entrances.

   The development of Parcel 2 will eliminate 2 acres of vegetation to create a research and development center, and possibly another half-acre of vegetation will be eliminated during regrading of the site.

3. Mitigation Measures.

   a. Landscape Plan. As a general rule, all vegetation within 20 feet of the property line will be preserved. A site landscape plan will be prepared with special attention to slope treatments. Although most of the restored slopes will have recently been hydroseeded, the landscape plan may recommend additional tree and shrub planting on the slopes. All perimeter planting areas will be evaluated to ensure that they meet City landscape screening requirements.

   b. Enhanced Wetlands Area. Approximately 5 acres of wooded slopes on Parcel 2 will be designated as an enhanced wetlands area in conjunction with the proposed detention pond at elevation 128.

E. Animals

1. Existing Conditions. Much of the site doesn't provide suitable habitat for most wildlife, being somewhat isolated from other open space areas, and hemmed in by residential development on two sides and by arterials and highways on the other two sides. The background noise levels of 60 to 65 dBA generated by traffic on Myers Way and Olson Place S.W. are not optimum for certain fauna species. The site is an urban environment, vastly different from a natural wild habitat area. (Source of Noise Data: Pg 25, FEIS Metro's White Center Park & Ride).

   Studies of birds and wildlife in the immediate vicinity of the site indicate that robins, thrushes, crows and starlings inhabit the area. Other wildlife sighted in the area include shrews, mice, garter snakes, toads and frogs.

2. Expected Impact. The major adverse project impact affecting wildlife will be removal of vegetation in the ravine and on the

knoll. Additionally, the increased noise levels, increase in impervious surface coverage, and human activity related to a business park would diminish its value for many wildlife species.

3. Mitigation Measures. Preservation of site trees along the perimeters of the site, and addition of new landscape materials on the slopes and throughout the business park will offset the adverse impact of removing site vegetation.

F. Energy and Natural Resources

1. Existing Conditions. Currently there is one residence on the site, using an estimated 15,000 kilowatt hours (kwh) annually for heating and lighting. The house will be retained. Electrical power lines exist on the site, and a gas main exists at So. Roxbury Street and Olson Place S.W.

2. Expected Impact. The proposal would require energy consumption during construction, for long-term operation, and for travel to and from the site. Seattle City Light has already indicated its willingness to serve the site, pending more detailed information about the site, and representatives of Washington Natural Gas Company have also indicated an interest in servicing the site.

An estimated 25.664 million kwh of energy would be required to construct the business park, including energy invested in materials, and fuel used by construction equipment. Additionally 1.232 million kwh of energy would be required to build the research and development center on Parcel 2, for a total of 26.896 million kwh to build the project. The estimates are based on conventional construction practices.

For the sake of simplicity, at this early stage, estimation of energy needs for continuing operation at the development were based on the assumption that all operating energy needs are to be met by electricity. Energy needs were broken down as follows in Table 4.

TABLE 4
ENERGY CONSUMPTION BY BUILDING TYPE[1]

Building Type	Low Estimate (kwh)	High Estimate (kwh)
Offices	2,841,600	5,683,200
Warehouses	1,769,112	13,268,340
Retail & Service	1,093,050	2,186,100
Restaurant	450,000	900,000
Total	6,153,762	22,037,640

[1] Based on consumption figures from Seattle City Light.

Thus consumption would range from a low estimate of 6.2 million kwh to a high estimate of 22.0 million kwh. Of this, 384,000 to 768,000 kwh would be consumed by the research and development center on Parcel 2.

Energy in the form of gasoline would also be required to power the estimated 11,000 vehicle trips that the proposed development would generate.

Assuming each commuter travels 10 miles each day, the estimated daily consumption of gasoline, at 15 miles per gallon, is 7,300 gallons per day. This consumption rate can be reduced in direct proportion to the percent of commuters using public transit.

3. Mitigation Measures.

The following mitigation measures will be considered.

a. Passive or active solar systems.

b. Energy-efficient building shells surpassing code standards.

c. Energy-efficient lighting inside and outside.

d. Maximum use of daylighting.

e. Waste heat recovery use within the facilities.

f. Central microprocessor-based controls.

g. Provide incentives to encourage use of public transit.